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June 28, 2002

162479 FRA-2002-12836-2

FEDERAL RAILROAD ADMINISTRATION
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OFFICE OF CHIEF COUNSEL

Secretary, Railroad Safety Board, RRS-3
Federal Railroad Administration
400 Seventh St., SW
Washington, D.C. 20590

Attn: Mr. Grady C. Cothen:

The Union Pacific Railroad Company (UP) is hosting a program to develop, test, demonstrate, and implement technology designed to prevent train collisions, overspeed violations, and to protect track maintenance personnel from trains. This technology is identified as the Positive Train Control system (PTC). To facilitate the testing and demonstration phase of the PTC program, the UP is requesting the Federal Railroad Administration to temporarily suspend compliance with certain rules in accordance with the provisions contained in Title 49 CFR 211.51. This letter will briefly describe the PTC program, identify the rules for which waiver is requested, provide justification for each waiver and answer safety concerns relating to the requested relief.

**Program Description**

PTC is a communications-based train control system designed to monitor each communicating train's position, velocity, and acceleration in real time and prompt the engineer to take action before a violation occurs associated with limits of authority, track bulletins, track speed, temporary speed restrictions, and working limits of track maintenance personnel. If the engineer fails to take to take the necessary action to slow or stop the train, PTC will initiate a full service brake application to stop the train before a violation occurs.

PTC will interface with the UP computer-aided dispatching (CAD) system, from which it will receive track bulletins, form-based authorities, and the dispatcher's requests for switches and signals. The PTC system will consist of four segments that work together to provide enforcement against train movement violations: the central office segment; the locomotive segment; the wayside segment, and the communications segment. The central office segment will consist of the PTC server that will develop and issue enforceable movement authorities and speed restrictions for each PTC-equipped train. This information is sent through the communications segment to the locomotive segment located on board the controlling locomotive of each train. The locomotive segment enforces a train's movement and speed limits by monitoring the train's location and speed,

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providing warnings, and applying the brakes to stop the train if necessary to prevent a violation of speed limit or authority. The wayside segment monitors the status of switches, signals, and track circuits, and forwards this status, via the communications segment, to the central office segment. The locomotive and wayside segments work in concert to provide for the advance activation of grade crossings with constant warning times for train speeds greater than 79 mph.

The following information is submitted in accordance with the provisions contained in 49 CFR 211.7, 211.55, and 235.10:

**(1) Corporate Name of Applicant**

Union Pacific Railroad Company, and
The National Railroad Passenger Corporation (Amtrak)

**(2) Manner in which Applicant Is Involved**

UP is the owning carrier that will test and demonstrate the PTC system on its property. Amtrak is a tenant.

**(3) Location of Project**

The PTC program will be tested and demonstrated on the UP's Joliet and Springfield subdivisions in the State of Illinois between Mazonia, milepost 62.6 and Ridgley, milepost 181.0, a distance of approximately 118.4 miles.

**(4) Tracks Involved**

All main track and signaled sidings between Mazonia and Ridgley will be included in this project.

**(5) Description of Proposed Relief Sought and Justification for Relief**

Relief is requested from the requirements contained in the regulations listed below, identified by CFR part, section and heading. Relief is sought only for the tests and demonstrations of the PTC system requiring waivers during the test period. If required, UP will submit a separate waiver application for implementation of a production system.

In certain cases identified below, relief is sought to establish clarification of the scope and applicability of a regulation during the test phase of PTC; in such cases, the request is intended as acknowledgment that the regulation is or should be suspended during the test phase. If found necessary, requests for permanent waivers will be made in the application for approval to implement a production PTC system.

Regulations not specifically cited in this application are considered, where appropriate, to be applicable to PTC. UP requests that the following requirements be suspended for the duration of the PTC test and demonstration period:

§216.13 **Special notice for repairs - locomotive.** Waiver is requested for PTC-equipped locomotives to the extent that non-operation of PTC equipment installed on board, whether through malfunction or deactivation, shall not be construed as an unsafe condition requiring special notice for repairs. Waiver is also sought for non-PTC-equipped locomotives operating in the PTC test territory to the extent that the absence of PTC equipment onboard shall not be construed as an unsafe condition requiring special notice for repairs.

*Justification:* With or without PTC equipment operating on board the controlling locomotive, a train remains subject to existing operating rules. PTC tests require flexibility in installing, removing, turning on, and turning off the equipment. The PTC tests will involve only a small subset of locomotives that will be PTC-equipped for testing.

§217.9 **Program of operational tests and inspections; recordkeeping.** Waiver is requested exempting operation of PTC equipment and procedures from the requirements for operational tests and inspections and associated recordkeeping.

*Justification:* During the PTC test phase, procedures for using PTC equipment and functions will be refined and modified. Until such procedures are defined, they cannot be addressed in the General Code of Operating Rules (GCOR). In any case, PTC is expected to have minimal impact on the operating rules.

§217.11 **Program of instruction on operating rules; recordkeeping; electronic recordkeeping.** Waiver is requested exempting tests of PTC equipment and procedures from the requirements for instruction and recordkeeping.

*Justification:* During the PTC test phase, procedures for using PTC equipment and functions will be refined and modified. Until such procedures are defined, they cannot be addressed in the GCOR. In any case, PTC is expected to have minimal impact on the operating rules.

Part 218 **[Subpart D] Prohibition Against Tampering With Safety Devices.** Waiver is requested exempting onboard PTC equipment from the requirements of §§218.51, 218.53, 218.55, 218.57, 218.59 and 218.61 to the extent that PTC equipment on board a locomotive shall not be considered a "safety device" subject to the provisions of this subpart at any time during the test phase.

*Justification:* PTC tests require flexibility in installing, removing, turning on, and turning off the onboard equipment. The UP also needs the flexibility to

permanently disable or remove PTC equipment in the event that a production system is not implemented.

§229.135 **Event recorders.** Waiver is requested to the extent that PTC equipment on board a locomotive shall not be considered an "event recorder" subject to the provisions of this section during the test phase.

*Justification:* PTC equipment by design will operate intermittently during the test phase. The data accumulated by the onboard PTC equipment will be used to develop and refine PTC functions. Such data can be expected to contain anomalies that do not reflect true operating conditions but by analysis will contribute to achieving necessary objectives in the PTC design.

§233.9 **Annual reports.** Waiver is requested exempting PTC operations in the test phase from the reporting requirements of this section.

*Justification:* UP recognizes that a PTC production system is subject to the provisions of this section, however, imposition of the requirements during the test phase would be an unnecessary paperwork burden.

§235.5 **Changes requiring filing of application.** Waiver is requested exempting PTC from the requirements of this section during the test phase.

*Justification:* PTC tests require flexibility in installing, removing, modifying, turning on and turning off the PTC equipment. UP also requires the flexibility to permanently disable or remove PTC equipment in the event that a production system is not implemented.

**§236.0 Applicability, minimum requirements, and civil penalties.** Waiver is requested from the requirements of paragraph (d) to the extent that PTC may be tested on test trains operated at a speed of 80 or more miles per hour.

*Justification:* During the PTC test phase, PTC will be tested to assure the system will function as intended at all speeds up to but not exceeding 110 mph. Tests at speeds of 80 or more mph will be made under absolute block conditions with no other train present. In addition, an appropriately equipped flagger will provide warning for each direction of highway traffic at each crossing equipped with active crossing warning signals for each test run made at speeds of 80 or more mph.

§236.4 **Interference with normal functioning of device.** Waiver is requested to the extent that PTC equipment be excluded from this requirement during the test phase.

*Justification:* During the PTC test phase, the "normal functioning" of PTC will be identified, refined and defined. PTC tests require flexibility in installing, removing, turning on and turning off the PTC equipment. With or without PTC equipment operating on board the controlling locomotive, the train remains subject to the provisions of the rules governing the existing methods of operation.

§236.5 **Design of control circuits on closed circuit principle.** Waiver is requested exempting PTC equipment from the closed circuit design requirement.

*Justification:* PTC is composed of solid state components that are software driven. Neither the hardware nor software can technically be designed to meet the provisions of this section.

§236.11 **Adjustment, repair, or replacement of component.** Waiver is requested exempting PTC components on board a locomotive from the requirements of this section.

*Justification:* **PTC** tests require flexibility in installing, removing, modifying, turning on and turning off PTC equipment. Failure of a PTC component during the test phase will not jeopardize the safety of train operations. With or without PTC equipment operating on board the controlling locomotive, the train remains subject to the provisions of the rules governing the existing methods of operation.

§236.15 **Timetable instructions.** Waiver is requested exempting PTC territory from the timetable designation requirement of this section during the PTC test phase.

*Justification:* The PTC test phase will consist of tests and demonstrations at undetermined intervals and identifying the test territory in the timetable would be both premature and an unnecessary paperwork burden.

§236.23 **Aspects and indications.** Waiver is requested to the extent that the PTC display on board an equipped locomotive shall not be construed to represent or correspond to signal aspects or indications subject to the requirements of this section.

*Justification:* The PTC design excludes any visual display of signal aspects or indications. PTC enforceable authorities, which may or may not derive from signal indications, are onboard. Text authorities, such as track bulletins, are displayed to the train crew. Information on the PTC display will correspond with but in no way represent authority conveyed through wayside signals.

§236.76 **Tagging of wires and interference of wires or tags with signal apparatus.** Waiver is requested exempting PTC equipment from the wire tagging requirement.

*Justification:* PTC hardware consists of computers, computer peripherals, and communication devices. While the inapplicability of this section to circuit boards, connectors and cables would appear obvious, waiver is sought for clarification.

§236.101 **Purpose of inspection and tests; removal from service of relay or device failing to meet test requirements.** Waiver is requested exempting PTC equipment from the requirement for removal of failed equipment from service.

*Justification:* PTC tests require flexibility in installing, removing, turning on and turning off the PTC equipment. With or without PTC equipment operating on board, a train remains subject to the provisions of the rules governing the existing methods of operation.

§236.107 **Ground tests.** Waiver is requested exempting PTC equipment from the requirement for ground tests during the test phase.

*Justification:* PTC hardware consists of computers, computer peripherals, and communications devices. Ground tests would serve no purpose in ensuring safety and could be damaging to the equipment.

§236.109 **Time releases, timing relays and timing devices.** Waiver is requested exempting PTC equipment from the testing requirement of this section during the test phase.

*Justification:* The timing devices in PTC equipment are software-driven, have no moving or visible parts, and are far more reliable than the devices for which this regulation was promulgated to address.

§236.110 **Results of tests.** Waiver is requested exempting PTC tests from the recordkeeping requirements of this section.

*Justification:* During the PTC test phase, the types of tests necessary to ensure appropriate levels of maintenance will be defined.

§236.501 **Forestalling device and speed control.** Waiver is requested exempting PTC from the requirement for medium-speed restriction.

*Justification:* PTC will not be connected to the signal system in the same manner as a conventional automatic train control system and will not enforce speed restrictions indicated by signal aspects. PTC will enforce permanent

speed restrictions reflected in the track database, temporary speed restrictions issued through the CAD system, and speed reductions as required by the limits of authority or conditions ahead.

§236.504 **Operation interconnected with automatic block-signal system.** Waiver is requested exempting PTC from the requirement of interconnection with an automatic block-signal system.

*Justification:* The PTC system will not be connected to the signal system in the same manner as a conventional automatic train stop, train control, or cab signal system. However, PTC will receive input from the signal system and operate to perform its intended function in the event of failure of the engineer to obey a restrictive condition displayed in the cab.

§236.511 **Cab signals controlled in accordance with block conditions stopping distance in advance.** Waiver is requested exempting the PTC onboard display from the cab-signal requirements of this section.

*Justification:* PTC is not an automatic cab signal system and will not be connected to the signal system in the same manner as a conventional cab signal system, but will receive input from the signal system that forms the basis for limits of authority and high speed operations that will be depicted on the PTC display.

§236.514 **Interconnection of cab signal system with roadway signal system.** Waiver is requested exempting PTC from the requirement of interconnection with a roadway signal system.

*Justification:* The PTC system will not be connected to the roadway signal system in the same manner as a conventional cab signal system, but will receive input from the signal system that forms the basis for limits of authority and high speed operations.

§236.515 **Visibility of cab signals.** Waiver is requested exempting the PTC display from the visibility requirements of this section during the test phase.

*Justification:* PTC is not a cab signal system and the design excludes any visual representation of signal aspects or indications.

§236.534 **Entrance to equipped territory; requirements.** Waiver is requested exempting PTC from the requirements of this section during the test phase.

*Justification:* PTC tests require flexibility in installing, removing, turning on and turning off PTC equipment.

§236.551 **Power supply voltage; requirement.** Waiver is requested exempting the onboard PTC power supply from the voltage requirement of this section.

*Justification:* PTC onboard equipment will function with more than a 50% variation in voltage.

§236.552 **Insulation resistance; requirement.** Waiver is requested exempting PTC equipment from the insulation resistance requirement of this section.

*Justification:* PTC onboard equipment consists of computers, computer peripherals, and communications equipment. Insulation resistance tests could be damaging to such components.

§236.553 **Seal, where required.** Waiver is requested exempting PTC from the seal requirement of this section.

*Justification:* The PTC system will allow for manual disablement of onboard PTC functions and equipment both remotely from the dispatching office and through an onboard manual function. Use of the onboard cutout function will be electronically monitored and reported to the dispatcher as an alarm.

§236.566 **Locomotive of each train operating in train stop, train control or cab signal territory; equipped.** Waiver is requested to the extent that the equipped requirements in the section shall not apply to PTC during the test phase.

*Justification:* A small subset of locomotives operating in the test territory will be PTC-equipped; the majority of trains will not be equipped. PTC tests require flexibility in installing, removing, turning on and turning off the onboard equipment. In any case, all PTC tests will be conducted under the provisions of the rules governing the existing methods of operation.

§236.567 **Restrictions imposed when device fails and/or is cut out en route.** Waiver is requested exempting PTC tests from the restrictions associated with device failure or cutout.

*Justification:* PTC tests require flexibility in installing, removing, turning on and turning off PTC equipment. All PTC tests will be conducted under the provisions of the rules governing the existing methods of operation and a failure or deactivation of PTC equipment will not jeopardize safety of train operations.

§236.586 **Daily or after trip test.** Waiver is requested exempting PTC from the requirements of this section during the test phase.

*Justification:* During the PTC test phase, the requirements for a daily or after trip test, if necessary, will be defined. An objective is to perform this test without human intervention.

§236.587 **Departure test.** Waiver is requested exempting PTC from the requirements of this section during the test phase.

*Justification:* During the PTC test phase, the requirements for a departure test will be defined. An objective is to perform this test without human intervention.

§236.588 **Periodic test.** Waiver is requested exempting PTC from the requirements of this section during the test phase.

*Justification:* During the PTC test phase, the requirements for periodic testing will be defined.

§236.703 **Aspect.** Clarification is requested exempting the PTC display from this definition.

*Justification:* PTC is not an automatic cab signal system and its design does not include any visual representation of signal aspects or indications.

§236.805 **Signal, cab.** Clarification is requested exempting the PTC display from this definition.

*Justification:* PTC is not an automatic cab signal system and its design does not include any visual representation of signal aspects or indications.

§240.127 **Criteria for examining skill performance.** Waiver is requested exempting PTC from the testing requirements of this section during the test phase.

*Justification:* Criteria and procedures for PTC performance evaluation do not yet exist; they will be identified and defined during the PTC test phase.

§240.129 **Criteria for monitoring operational performance of certified engineers.** Waiver is requested exempting PTC from the performance monitoring procedures during the PTC test phase.

*Justification:* Criteria and procedures for PTC performance evaluation do not yet exist; they will be identified and defined during the PTC test phase.

It is acknowledged for clarification that PTC, when fully operative during the test phase, will comply with the following regulations:

**Part 234 -- GRADE CROSSING SIGNAL SYSTEM SAFETY**

All sections.

§236.8 **Operating characteristics of electromagnetic, electronic, or electrical apparatus.** PTC computing equipment will comply with this regulation.

§236.501 **Forestalling device and speed control.** PTC is designed to enforce maximum authorized speeds, speed restrictions, slow speed and absolute stop. PTC will comply with §236.501 except for paragraph (b)(2).

§236.502 **Automatic brake application, initiation by restrictive block conditions stopping distance in advance.** PTC is designed to initiate an automatic brake application stopping distance in advance of the end of limits of authority; a train or locomotive; or the beginning of each lower speed restriction in the route.

§236.503 **Automatic brake application; initiation when predetermined rate of speed exceeded.** PTC will comply with this regulation.

§236.505 **Proper operative relation between parts along roadway and parts on locomotive.** PTC will function as intended under all conditions of speed, weather, oscillation and shock. PTC will comply with this regulation.

§236.506 **Release of brakes after automatic application.** After a PTC-initiated brake application, brakes cannot be released until the train is stopped.

§236.507 **Brake application; full service.** PTC will comply with this regulation.

§236.508 **Interference with application of brakes by means of brake valve.** PTC equipment will not interfere with or impair the efficiency of the automatic or independent brake valves.

§236.509 **Two or more locomotives coupled.** PTC will be made operative only on the controlling locomotive; however, PTC tests that do not affect train operations may occur on trailing locomotives.

§236.513 **Audible indicator.** The audible indicator for PTC will have a distinctive sound and be clearly audible under all operating conditions.

§236.516 **Power supply. PTC** equipment will have its own isolated power supply.

§236.565 **Provision made for preventing operation of pneumatic brake-applying apparatus by double-heading cock; requirement.** Operation of the double-heading cock (cutoff pilot valve) will not cut out PTC before the automatic brake is cut out.

PTC testing will temporarily require additional operating personnel on the [illegible]. The additional

§236.590 **Pneumatic apparatus.** Pneumatic apparatus will be inspected and cleaned as required.

Part 236 **Subpart G--Definitions.** As applicable except §236.703 and §236.805.

**(6) Justification for Relief From The Requirements**

For clarity, this information was included in paragraph (5) above.

**(7) Approximate Dates of Beginning and Completion of Project**

Waiver of the specified regulations is requested for a PTC testing period commencing September 1, 2002 and extending to the conclusion of the PTC test phase. The testing period is not expected to exceed two years and will terminate August 31, 2004 unless the UP notifies the FRA of an earlier termination date. As clarification of the overall development and testing of the PTC system, tests of a benign nature of various PTC subsystems and components not requiring the exercise of any waiver have begun and will continue through the end of the formal test period on August 31, 2004. These tests include but may not be limited to tests of communications coverage and capacity, tests of communications protocols, and tests of the PTC Location Determining System (LDS).

**(8) Changes in Operating Practices**

The present method of operation on the territory stated in this waiver request is by signal indications of a traffic control system. This method of operation will not be affected during the PTC test period.

PTC testing will temporarily require additional operating practices of a benign nature, but only on PTC-equipped test trains and only when a test is in progress. The additional operating practices contemplated for PTC test trains will include PTC initialization procedures, digital transmission and onboard display of authorities and restrictions, enforcement of limits of authority and speed limits/restrictions through automatic brake applications, and procedures for recovery following an enforcement action.

**(9) Effect on Safety of Operations**

The PTC tests will have minimal impact on operations and no adverse impact on the safety of train operations. The current methods of operation will remain in effect whether PTC is operative, fails, or is cut out. Tests at speeds of 80 or more mph or those involving the display of the PTC aspect on wayside signals will be conducted under Absolute Block conditions only. During tests at speeds of 80 or more mph, flaggers will provide warning in each direction of highway traffic at crossings equipped with active crossing signals. No PTC tests requiring the exercise of the requested waivers will be conducted on revenue trains. Benign tests not requiring the exercise of the requested waivers such as tests of

communications coverage or Location Determining System (LDS) accuracy may be conducted using revenue trains.

**(10) Conformance with FRA Rules and Regulations**

The PTC tests will comply with all FRA rules and regulations except those that are waived by FRA.

**Conclusion**

UP and Amtrak stand ready to provide any additional information or clarification needed to expedite approval of this application. We would appreciate an accelerated review and processing to allow for any impact that may affect the development of the design specifications. One of the program's objectives is the commencement of selected PTC tests and demonstrations requiring these waivers on or after September 1, 2002. We appreciate your support of this important step in the PTC development program.

Sincerely,

Dennis J. Duffy
**Union Pacific**

**Amtrak**
As amended by letter
From D.J. Hughes to
Grady Cothen (FRA)
Dated 10/15/02